

Treatment options for conoid teeth: A literature review

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Abstract— There are several reasons that can cause aesthetic damage to patients' smiles. Among them are those caused by dental anomalies, where dental anomalies of size stand out, in particular microdontia, which provides the affected teeth with short clinical crowns and often without contact points (conoid teeth). The present study aims to review the available literature regarding the aesthetic and rehabilitative treatment of teeth with reduced size that can be carried out through restorative procedures (direct or indirect) associated or not with other auxiliary treatments, such as orthodontic treatment, for example. The aesthetic characteristics of adaptation to the natural tooth color, ability to adhere to dental tissue, less need for complete tooth removal and the low cost compared to indirect materials are some of the reasons for the great popularity of composite resins. Regarding veneers, as there is no need for much dental preparation before placing the veneers, the conoid tooth does not need to be further compacted or shrunk, however, the cost must be analyzed. The price of resin or porcelain veneers is, for many patients, the decisive factor when choosing the best technique with laminated veneer. The price of resin veneer is, in most dental services, lower than porcelain veneer. The reasons for the lower costs range from the reduced number of consultations and the dismissal of dental prosthesis laboratories responsible for making ceramic laminates. Thus, it is concluded that conoid teeth are changes in size and shape of natural teeth. These changes have an aesthetic effect on the patient's smile, as the affected teeth are smaller than normal and have a sharpened incisal surface; The restorative technique using composite resins presents itself as an excellent alternative to re-anatomize conoid teeth when the treatment is planned and carried out in a detailed manner, and because it is less costly to the patient.

I. INTRODUCTION

Currently, dental and facial appearance is a major concern for clinicians in the field of restorative dentistry and dental prosthesis, as well as for patients (REZENDE; FAJARDO, 2016). Aesthetic problems are one of the most common reasons for consultations in dental offices, probably because issues related to appearance can

influence many aspects of a patient's life, including their personality, physical attractiveness, work and human relationships (OLIVEIRA et al., 2020).

Among the various reasons that can cause aesthetic damage to the smile of patients are those caused by dental anomalies, which are defined as congenital malformations of dental tissues that occur as a result of changes that

affect the natural process of odontogenesis, in which several genes that regulate intervene the process, if altered, can damage the primary or permanent dentition or both, causing delay in the change from primary to permanent dentition and, sometimes, lack of development of the jaws; in addition to affecting characteristics such as number, size, shape, structure and color of one, some or all teeth (LOBATO et al., 2019; REIS et al., 2016; SANTOS et al., 2015).

One of the anomalies that most generate aesthetic complaints due to its characteristics is microdontia, which refers to teeth that are smaller than normal. It is a dental variation that is distinguished by the reduction in the mesiodistal and cervico-incisal diameters (due to coronary alteration or level of the gingival margins) of the dental crown, which is why they are considered small teeth with adequate anatomy. It can occur in a generalized way or in a single tooth, with the upper lateral incisor being the one that most frequently presents changes in size and shape (SILVA et al., 2016).

When the lateral incisors are affected by this anomaly, they will often present a conoid shape, bringing an unsightly result to the patient's smile, but still offering great conditions for the rehabilitation treatment to be successful. Dentistry today offers several treatment options depending on the patient's expectations and the clinician's experience, such as: crowns, dental restorations or ceramic veneers (LOBATO et al., 2019; REIS et al., 2016).

Thus, given the above, the aim of this article is to review the literature on the reanatomization of conoid teeth, focusing on the treatments used with the aim of providing the patient with smile esthetics and harmony.

II. LITERATURE REVIEW

2.1 Conoid teeth

Microdontia has been related in the literature to a hereditary pattern, which is manifested by teeth with a crown smaller than normal in relation to the other elements of the mouth. This means that the root is normally of normal size, although it may be oddly shaped, and that it is the crown part, the visible part of the tooth, that is smaller than normal. Microdontia is divided into localized or partial and generalized microdontia, depending on the number of teeth affected. The most common is partial, which occurs when microdontia is presented only in some specific parts. Typically, the most affected teeth are the upper incisors (most anterior teeth), one or both. In generalized microdontia, all teeth are smaller than normal, which can occur in pituitary dwarfism. A different problem is when the pieces are small in relation to the

maxilla, due to their large size and, therefore, small teeth are evaluated (SILVA et al., 2016).

Dental anomalies occur between the sixth and eighth week of intrauterine life, as in this phase embryonic structures such as the dental sac, dental papilla and dental organ are converted, which in the histodifferentiation process will give rise to the formation of enamel, dentin and cement (LOBATO et al., 2019; OLIVEIRA; MIGUEL; MAGALHÃES, 2021).

Tapered teeth, as an expression of microdontia which is a dental anomaly, were described by Dr. Grahnén as those teeth in which the incisal mesiodistal width (incisal width) of the ring is smaller than the cervical width (the width of the area close to the gum line). It is an anomaly in the shape of the teeth, as they present an abnormal shape, and the affected tooth has a conical appearance. Conoid teeth have a prevalence of 0.6 to 9.9%. About 55 people are affected by cone-shaped upper lateral teeth, with women more prone than men (LOBATO et al., 2019; REIS et al., 2016).

The causes of dental anomalies, more specifically of conoid teeth, can be mainly associated with genetic factors such as dwarfism due to hypofunction of the pituitary gland. Small teeth in normal or large jaws may be due to cross-inheritance. Regression or atavism may be the cause of the rudimentary development of individual teeth, which take the cone or haplodon shape of the reptile or fish dentition. This abnormality is often inherited and occurs especially in the weaker teeth, the upper second incisors (SILVEIRA et al., 2015).

This anomaly can lead to lack of space, unfavoring the arch length, not only involving esthetics, but also impairing occlusion, since other teeth may adopt an incorrect position. Its etiology is related to hereditary, environmental, genetic and epigenetic factors. A possible method to diagnose microdontia of the upper lateral incisor when it is smaller, equal to or up to 0.7 mm wider than the lower lateral incisor, the result would be an excess of lower dental material in relation to the upper one (AGUIRRE et al., 2015).

Microdontia in any tooth can cause changes in the sagittal dimensions of the arch and these can be treated through restorative procedures to preserve esthetics and occlusion, taking into account a multidisciplinary diagnosis and treatment that includes evaluation by Periodontics, Orthodontics, Rehabilitation and Endodontics. Therefore, it is necessary to consider several factors, both aesthetic, functional, social and cultural (SILVA et al., 2016).

2.2 Treatment alternatives

According to Lima (2019), there are several treatment options for conoid teeth, ranging from less invasive, such as direct and indirect restorations, to more invasive, which correspond, for example, to extraction of conoid teeth and placement of an implant or a fixed prosthesis.

2.2.1 Composite resin

Since their introduction in the 1960s, composite resins have become increasingly popular and are now considered universal materials, being the first choice for direct restorations on anterior and posterior teeth. The aesthetic characteristics of adaptation to the natural tooth color, ability to adhere to dental tissues, less need for complete tooth removal and the low cost compared to indirect materials are some of the reasons for the great popularity of composite resins (GUERRA et al., 2017).

It took some time for resin-based composites to be considered suitable materials for restoring anterior and posterior teeth. Poor wear resistance and mechanical strength were deficiencies of early generations of dental composites, at a time when silver amalgam was the gold standard material. Over time, advances in resin phase composition (eg monomers with higher molecular weight and lower polymerization shrinkage) and inorganic filler particles (eg higher loading, smaller size and distinct morphologies) have led to significant improvements in the properties of the resin material. Current compounds also have greater color stability and better optical properties (BERWANGER et al., 2016).

Thus, the problems related to the selection of the proper composite resin is less of an issue nowadays. This does not mean that professional preferences and handling conditions, for example, are insignificant; rather, it indicates that the selection of restorative composites is currently not based on clinical performance, as the composite effect is only one of many aspects that influence clinical performance (LIMA, 2019).

Composite resins are a complex mixture of polymerizable resins mixed with inorganic filler particles. To bond the filler particles to the resin matrix, the particles are coated with silane, a bonding agent. Other additives are included in the formulation, such as photoinitiators, which initiate polymerization, adjust viscosity and improve radiographic opacity (MARTINS et al., 2017).

The resin matrix is composed of aliphatic or aromatic dimethacrylate monomers. These monomers (Bis-GMA - bisphenol-A-glycidyl methacrylate and triethylene glycol dimethacrylate - TEGDMA) play a fundamental role in the potential of polymerization shrinkage of resins. Usually used together, this system presents relatively satisfactory

clinical results, but there are still properties that need to be improved, such as resistance to abrasion (PAMPULHA et al., 2015; SOARES; PINTO, 2019).

Filler particles provide dimensional stability to the resin matrix and improve its properties, reducing polymerization shrinkage, water sorption and thermal expansion coefficient, providing an increase in tensile, compression and abrasion resistance, increasing the modulus of elasticity (stiffness) of the composite resin (ARAÚJO et al., 2019).

During the initial development of composite resins, material properties were shown to depend on the formation of a strong bond between the inorganic filler and the organic matrix (resin). The union of these two phases is obtained by coating the charge particles with a binding agent, silane (NOBRE; GOMES, 2020).

Direct restorations in composite resins are indicated due to the great advances and increasing improvements in adhesive systems and composite resins. The main advantages of this type of rehabilitation are the easy repair procedure, easy execution, function and esthetic restoration, and the highly conservative character of this treatment, since little tooth structure is removed (DIAS et al., 2020).

Dias et al. (2020) also highlight that the silicone index helps to control the shape of the tooth in the execution of restorative treatment, which reduces the treatment time and determines anatomical dental contours that must be copied from the diagnostic wax-up.

The search for minimally invasive esthetic restorations has increased every day in dental clinics, and surgeons often have difficulties in choosing composite resins due to their lack of experience. For this choice, the dentist must evaluate each patient and the characteristics of each resin. In the same way as the physical characteristics of composite resins, the optical characteristics are of great relevance during a restorative procedure, such as color, translucency, opalescence and fluorescence, which are determining factors in the stratification and mimicry of the tooth structure (PAMPULHA et al., 2015 ; SOARES; PINTO, 2019).

Orthodontic treatment is used for conoid teeth as a previous auxiliary treatment (maintenance of the space to open or close space and adjustment of the midline and other occlusal characteristics when necessary) of any of the other treatments (resin and prosthesis) (PERASSO; IMELIO; ALCIDI, 2018).

2.2.2 Ceramic laminates

Ceramic veneers (LC), which are chosen to provide excellent esthetics, are a well-established treatment

method for the conservative esthetic restoration of malformed, discolored, misaligned, traumatized, fractured and worn anterior teeth. The recommended surface preparation within the enamel and adhesive cementation facilitate restoration with minimal loss of healthy tooth structure (ABRANTES et al., 2019).

Oliveira et al. (2021) present the following classification for indications for ceramic veneers:

Type I: teeth resistant to bleaching

- Type IA: tetracycline discoloration
- Type IB: teeth that do not respond to whitening

Type II: Main morphological changes

- Type IIA: conoid tooth
- Type IIB: Diastema or interdental triangles to be closed
- Type IIC: Increased incisal length or facial prominence

Type III: extensive restorations

- Type IIIA: Extensive coronary fracture
- Type IIIB: Extensive loss of enamel from erosion and wear
- Type IIIC: generalized congenital malformations.

Within this classification system, the use of LCs with minimal preparation and no preparation can conservatively achieve the desired aesthetic result for Types I and II. Initially, LCs were fabricated from stacked feldspathic porcelain and used in an “unprepared” manner 0.5–0.7 mm thick. While not removing healthy tooth structure was admirable, it often provided less-than-desirable results. The laminates often looked bulky and the soft tissue showed signs of irritation. It is important to remember that the ultimate goal of any dental treatment is to restore health and function, as well as esthetics, using the most conservative treatment method available (ESPÍNDOLA-CASTRO et al., 2020).

Many studies suggest a minimum thickness of 0.5 mm for dental preparations for CL. Freehand preparation can result in variable depth of preparation with dentin exposure. Ferrari et al. in 2005 they sectioned and measured the thickness of the labial enamel of 114 extracted incisor and premolar teeth at three locations, the gingival third, the middle third and the incisal third, with the results indicating that the enamel thickness in the gingival third was 0.3-0.4 mm for the incisor teeth. The authors argued that as enamel must be reduced by 0.5 mm in a veneer preparation, this would result in exposure of dentin at the gingival margin or, alternatively, if teeth were reduced less, an over-contoured restoration could result

(GUGELMIN et al., 2020; OLIVEIRA JÚNIOR et al., 2019; TOMASELLI et al., 2019).

Inadequate lip reduction can potentially lead to increased varnish volume, whereas overreduction unnecessarily results in more extensive exposure of the dentin. In cases where the operator is not able to obtain a uniform reduction of the labial surface, taking into account the facial contours of the tooth, it is common to find areas of inadequate and unnecessarily extensive reduction within the same preparation. Given the tendency of insufficient preparation when teeth are prepared freehand, it is recommended to use an index drill or appropriate depth when teeth are prepared for LCs (OLIVEIRA JÚNIOR et al., 2019).

Patients with bruxism or tooth-to-foreign body contact may not be ideal candidates for veneers. In cases of minor incisal wear due to bruxism, it is often possible to restore the incisal length using LCs. It is very important to evaluate the occlusal scheme and control the occlusal forces before attempting any LC treatment. In these cases, an occlusal protection is indicated to help prevent postoperative ceramic fractures (ABRANTES et al., 2019; ESPÍNDOLA-CASTRO et al., 2020).

Abrantes et al. (2019) point out in their studies that because there is no need for much dental preparation before placing the veneers, the conoid tooth does not need to be further compacted or shrunk.

Given this, it is pointed out that the cost should be analyzed in principle due to the fact that the indirect veneers, whether they are resin, ceromeres or porcelain, are much more costly to the patient than the direct composite resin veneers. The price of resin or porcelain veneers is, for many patients, the decisive factor when choosing the best technique with a laminated dental veneer (ABRANTES et al., 2019; TOMASELLI et al., 2019).

The price of resin veneer is, in most dental services, lower than porcelain veneer. The reasons for the lower costs range from the reduced number of appointments – the treatment is carried out in a single appointment – to the dismissal of dental laboratories responsible for making ceramic laminates (ABRANTES et al., 2019; ESPÍNDOLA-CASTRO et al., 2020).

Other factors also contribute to further widening the price difference between resin and porcelain veneers. The main one, in the case of the porcelain technique, is the quality and experience of the dental laboratory. There are countless variations in composition and manufacturers, and they present different prices for each one of them – choices that directly imply the costs of these procedures (ABRANTES et al., 2019; TOMASELLI et al., 2019).

The success rate of LCs was clinically evaluated and showed a range from 18 months to 20 years; the success rate reported in these studies ranges between 75% and 100%. Fracture, microleakage and detachment are types of failure observed in LCs (ABRANTES et al., 2019).

The preparation of teeth greatly influences the durability and color (translucency and shade) of the ceramic restoration, as the dental preparation will determine the internal surface contour and thickness of the ceramic material. A laminate requires a minimum of 0.2 mm to (ideally) 0.3 mm thick for each shade change. Ceramic translucency also plays an important role in light penetration (TOMASELLI et al., 2019).

2.2.3 Dental prosthesis

In cases of severe microdontics, with extreme reduction in the dimensions of the teeth, more invasive prosthetic treatments are chosen, such as making fixed prostheses (unitary crowns) for those teeth. In case of teeth with reduced dimensions and little or no periodontal support (bone insertion), the clinician can opt for conoid tooth extraction and rehabilitation with removable dentures or dental implants (AGUIRRE; NOBORIKAWA; 2015).

III. METHODOLOGY

To carry out this work, a narrative literature review was carried out containing 17 articles that reference the treatment options for conoid teeth in the context general and specific to the proposed theme. Searches were performed in the Pubmed, Scielo and Google academic databases, for articles published between 2016 and 2021, using the keywords: "Microdontics", "Aesthetic restorations", "Conoid teeth", "Compound resins", "Ceramic laminates" or their respective terms in English.

IV. DISCUSSION

The smile is the most important segment in dentofacial cosmetic composition and the presence of dental anomalies in this segment can compromise its balance and harmony. Changes in the shape, size, position, color and texture of teeth have increased the demand for dental treatments, as they may set a pattern far from that established by the media and society today (LOBATO et al., 2019; REIS et al., 2016 ; SANTOS et al., 2015).

It is up to the dentist, after detailed anamnesis and correct diagnosis, to assess the patient's expectations and present possible therapeutic solutions, highlighting the best technique and the most appropriate material for each clinical situation (OLIVEIRA et al., 2020; SANTOS et al., 2015).

Isolated microdontics is a type of dental anomaly with greater prevalence in the upper lateral incisors. These teeth, called conoids, present a change in shape and size of the crown, giving the patient an atypical and childlike smile. The presence of anterosuperior diastemas associated with this morphological change and the reduction in the mesiodistal diameter of the lateral teeth, which allows tooth movement, are very common (LOBATO et al., 2019; OLIVEIRA; MIGUEL; MAGALHÃES, 2021).

In the initial approach, molding to prepare the model study, radiographs, as well as photographs from different angles so that the professional can observe and prepare the treatment plan are very important. For esthetic correction of the conoid tooth, the professional can use direct or indirect dental anatomization techniques. Indirect techniques, such as the manufacture of ceramic laminates or dental contact lenses, have advantages related to color stability, gloss stability and wear resistance. However, the need for dental preparation, the greater number of consultations, and the high cost may represent limitations of the technique (AGUIRRE et al., 2015; SILVA et al., 2016).

The current restorative dentistry advocates a minimum of invasive philosophy, where the professional should choose, whenever possible, procedures that preserve tissue and avoid the loss of healthy tooth structure. Due to technological advances in esthetic dentistry, current compounds are able to meet the esthetic requirements of inconspicuous restorations. Furthermore, the use of composite resins for esthetic corrections has advantages over other techniques, due to the possibility of reversibility, lower costs with the patient and less time in the chair (BERWANGER et al., 2016).

Among the types of resins available on the dental market, nanoparticulates have excellent mechanical properties compared to previous resins and excellent aesthetics. The presence of particles from 5 to 20 nanometers, representing 78% of the weight in the load, allows for greater surface smoothness and maintenance of gloss (GUERRA et al., 2019; PAMPULHA et al., 2015; SOARES; PINTO, 2019).

In a setting where failures due to inadequate selection of materials are minor, restorative technique and other clinical conditions may be of greater importance. Literature shows that tooth position (posterior teeth have to bear higher mechanical loads), use of a thick glass ionomer cavity lining layer, presence of endodontic treatment, absence of peripheral enamel approximately are all factors that can negatively affect clinical longevity. In contrast, frequently mentioned factors, such as enamel chamfering, use of rubber insulation, and use of direct versus indirect

composite, have not been shown to be related to clinical performance. In many situations, such as in the selection of the bonding system, a material-dependent effect also interferes with clinical performance (PEREIRA et al., 2017; GOUVEIA et al., 2018).

Impaired vision of malformed teeth, such as conoid laterals, can be successfully improved by porcelain or ceramic restorations. A precise and interdisciplinary diagnostic approach is advised to obtain aesthetic, conservative, predictable and lasting results in the maxillary anterior dentition (ABRANTES et al., 2019; GUGELMIN et al., 2020; TOMASELLI et al., 2019). In this sense, Silami et al. (2016), evidenced in their studies that diagnostic additive waxing, aesthetic elongation of the clinical crown, direct acrylic mock-up, cementation procedures, direct restorations with composite resin used for the aesthetic rehabilitation of a patient with conoid lateral incisors, and a unsatisfactory Class IV restorations in the central incisor were presented and, as an alternative, ceramic veneers, ensuring their practicality and duration, unlike other techniques already used in the study patient.

Corroborating the previous notes, Abrantes et al. (2019) mention that ceramic laminates are one of the most used cosmetic dentistry services in the market. Many dentists use laminates as a solution for certain forms of microdontia, especially conoid teeth. As much dental preparation is not required before placing the veneers, the already small tooth does not need to be further compacted or shrunk. Ceramic, a strong, high-quality material, helps make new teeth natural while making teeth more durable.

Gugelmin et al. (2020) and Oliveira et al. (2021) reinforce that porcelain materials have great biocompatibility and, at the same time, can maintain favorable dental esthetics and patient satisfaction. These studies, with evaluation times ranging from 5 to 20 years, support that therapy with ceramic veneers in conoid teeth has a favorable clinical performance.

Lobato et al. (2019) suggested that the success of the ceramic veneer technique on conoid teeth involves paying close attention to detail for the following: case planning, conservative preparation (to save enamel) of teeth, proper selection of ceramics, proper selection of materials and methods adequate cementation, finishing and polishing of restorations, and adequate planning for ongoing maintenance.

Cabral et al. (2016), in turn, treated a patient aged 22, due to a complaint of separation between the lateral and canine teeth on both sides, that is, involving dental elements 12, 13, 22 and 23. undergoing orthodontic treatment, it proved unsuccessful and, therefore, the woman sought care, in order to seek a solution. After

removing the orthodontic appliance, scaling with an ultrasonic instrument and prophylaxis, it was possible to evaluate how the treatment would take place. Composite resins were used and increments were made to adjust the appropriate size. Afterwards, there was a finishing and polishing. The result was satisfactory, given the transformation of spaces for better adaptation in the arcade

In relation to an orthodontic treatment using ceramic veneers, one can cite the one carried out by Perasso, Imelio and Alcidi (2018), in which it was necessary to treat a 27-year-old woman with esthetic complaints regarding her smile and front teeth. Initially, in addition to other problems identified, there was a change in the shape of the upper lateral incisors and a small diastema between the central incisors. Therefore, the steps for therapeutic intervention were firstly to perform an orthodontic treatment, followed by whitening, analysis with the patient as to the lateral shape that the patient wanted and, finally, the reconstruction of the upper sides with ceramic veneers. As a result, a correct distribution of spaces between the upper lateral incisors was obtained, as well as their inclination, which resulted in a reduction in overbite. In addition, there was an improvement in lip support and the initially conoid teeth were restored, forming a good integration with the natural teeth. With that, the patient was satisfied.

V. CONCLUSION

Given the above, the following conclusions can be drawn:

- Conoid teeth are changes in size and shape of natural teeth. These changes have an aesthetic effect on the patient's smile, as the affected teeth are smaller than normal and have a sharpened incisal surface;
- The restorative technique using composite resins is an excellent alternative to re-anatomize conoid teeth when the treatment is planned and carried out in a detailed manner;
- Ceramic veneers are a well-established treatment method for the conservative esthetic restoration of malformed teeth, such as conoids, and when made according to proper indications and a precise clinical protocol, they offer excellent longevity and appearance. Not all patients can bear the costs of procedures with ceramic veneers, as they can be quite costly when the number of teeth involved is high.
- The minimally invasive cosmetic dentistry should choose the most conservative method possible, avoiding unnecessary wear and tear on the tooth structure.

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